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ANALYZING CREDIT RISK FACTORS: A WESTERN BALKANS CASE STUDY⁵

The purpose of this research paper is to determine factors of credit risk expressed in terms of non-performing loans in six countries of the Western Balkans (Kosovo, Albania, North Macedonia, Bosnia, and Herzegovina, Montenegro, and Serbia). The research uses different econometric techniques for the presentation of econometric models, where 4 models are used: OLS, fixed-effects model, random-effects model, and Hausman Taylor IV estimators. The results from the empirical analysis presented show that unemployment and the real interest rate have a positive impact on the growth of non-performing loans where both coefficients are statistically significant at the 1% level, while other variables (financial stability, economic growth, and inflation) show a statistically significant negative impact. These findings are important for the decision-makers of the financial systems of these countries, especially countries that have limited use of monetary policy, making decisions to create greater financial stability to reduce credit risk.

Keywords: Risk; Unemployment; Economic Growth; Western Balkans; Financial Stability

JEL: G32; J64; O40; P27; G01

1. Introduction

Credit risk is the possibility that a borrower will default on their debt obligations or fail to make timely payments. It is the risk that a lender takes when extending credit to a borrower, and it is a major concern for banks, financial institutions, and investors who lend money or invest in debt securities. Credit risk can be influenced by several factors, including the

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borrower's creditworthiness, financial stability, and ability to generate sufficient cash flows to meet their debt obligations. It can also be affected by external factors, such as changes in interest rates, economic conditions, or industry-specific risks. A significant number of studies (Ali, 2010; Wagner, 2006; Kiff, 2002; Herring, 1999; Goodhart, 2005) conclude that the financial stability of a country is closely related to the credit risk of borrowers, moreover, most of the authors, which have a statistical and empirical basis, show that during the various global financial crises, there is a positive relationship with the increase in credit risk. Other authors (Chaibi, 2015; Castro, 2013; Erb, 1995; Haris, 2023) show Inflation can have a significant impact on credit risk, especially through its effect on interest rates. As inflation rises, central banks often respond by raising interest rates to control it. This can increase borrowing costs for individuals and businesses, making it more difficult for them to repay their debts. Higher interest rates can also lead to a decline in economic activity, which can further increase the credit risk of borrowers. In addition, inflation can erode the purchasing power of the currency, making it harder for borrowers to repay their debts in real terms. As a result, inflation can lead to an increase in default rates and credit losses for lenders. Therefore, lenders must carefully monitor inflation trends and adjust their credit risk management strategies accordingly to mitigate the impact of inflation on credit risk.

Hence, the primary objective of this research is to identify the key elements that contribute to credit risk in six developing nations in Southeast Europe: Kosovo, Albania, North Macedonia, Montenegro, Serbia, and Bosnia and Herzegovina, the latter being considered a developed country. These countries were selected due to their comparable political, social, and economic conditions, rendering them highly suitable for examination. So, the research question is which are the most important credit risk determinants? To answer the research question, inflation, interest rate, financial stability, unemployment, and economic growth were taken as variables for the study.

The study's focus on credit risk in six developing nations in Southeast Europe, specifically Kosovo, Albania, North Macedonia, Montenegro, Serbia, and Bosnia and Herzegovina, addresses a significant gap in the existing literature by offering a comprehensive analysis of credit risk determinants in these countries. The choice of this specific region is motivated by its comparable political, social, and economic conditions, making it a unique and informative case for examination. While previous studies have predominantly concentrated on econometric models with limited reliability, this research employs a diverse range of techniques, including pooled OLS, fixed and random effects, and the Hausman-Taylor model with instrumental variables (IV), to effectively address endogeneity concerns. Moreover, the inclusion of a social factor such as unemployment alongside financial factors enhances the study's relevance, especially in the context of countries in transition. By identifying the key elements influencing credit risk, the research contributes valuable insights to the global body of knowledge, offering a nuanced understanding of credit risk dynamics in a region that has been relatively underexplored in the existing literature.

This paper's main contribution lies in identifying the factors that influence credit risk. While many previous studies have utilized econometric models like linear regression, fixed effects, and random effects, these methods have faced criticism for their limited reliability in producing robust results, mainly due to the neglect of endogeneity issues or exclusive reliance on pooled OLS. To overcome these limitations, we adopt a diverse range of techniques,

including pooled OLS, fixed and random effects, and the Hausman-Taylor model with instrumental variables (IV), to effectively address endogeneity concerns. Another contribution of this paper is that we also take the social factor (unemployment) as a basis, where most of the research carried out on credit risk examines financial factors, while in this paper, in addition to financial factors, a social factor such as unemployment is also examined, which it is considered a very important variable for credit risk, especially in countries in transition.

In conclusion, the regression analysis reveals that unemployment and interest rates have a positive influence on non-performing loans, whereas financial stability, economic growth, and inflation rates exhibit negative effects on non-performing loans. The paper is structured into four sections: a literature review, methodology and data analysis, a discussion and interpretation of the findings, and finally, concluding remarks and suggestions for future research.

2. Literature Review

This chapter provides an extensive analysis of existing literature, exploring the research conducted by various authors who have empirically studied the factors influencing credit risk across different countries and time periods.

In the study conducted by Koju (2020) study, the focus was on evaluating the relationship between macroeconomic indicators and credit risks in developed countries, using the GMM model for 49 nations during 2000-2015. The findings highlight the significant role of macroeconomic variables in credit risk stability. The author recommends that developed countries enhance productivity and implement employment promotion policies to reduce non-performing loans. These findings align with Gulati et al.'s (2019) research on the banking industry in India from 1998 to 2014, using panel data models. Their results indicate a strong sensitivity of non-performing loans to macroeconomic factors. Regarding the financial factors that affect credit risk, many works have been carried out, mainly in an empirical way.

Barra's (2021) research, spanning 2001 to 2014, asserts that financial crises significantly influence credit risk. Notably, crises in 2008 and 2012 led to increased non-performing loans due to rising interest rates, posing a threat to financial stability. This highlights the interconnected dynamics between financial crises, interest rate fluctuations, and credit portfolio vulnerability. Similarly, Khan (2020) finds, in the period 2005-2017, that non-performing loans and banking sector stability are interconnected, with interest rate movements impacting financial stability and contributing to increased non-performing loans.

The author's study Ali (2010) points out that the global financial crisis of 2008 has highlighted the importance of understanding financial volatility, especially in the context of credit risk management with special emphasis on the banking sector. The methodology used by this author is quantitative with the OLS model. In the research, the author presents a comparative analysis between the United States of America and Australia, where the findings show that the United States of America is much more sensitive to macroeconomic shocks, endangering financial stability, which then has an impact on increasing the risk of non-payment of the loan.

Das (2007) conducted a research study in India utilizing advanced panel data techniques to investigate the factors influencing credit defaults. The study spans the period 1994-2005. The findings derived from the fixed and random effects econometric models indicate that macroeconomic factors such as GDP growth, as well as bank-level factors including real credit growth, operating expenses, and bank size, play significant roles in shaping non-performing loans.

Similarly, Mpodu (2018) conducted research on macroeconomic determinants of credit risk in the banking systems of 22 sub-Saharan African economies. The author employed dynamic panel data methods and analyzed data from 2000 to 2016. The findings from the econometric model specifications demonstrate that economic growth has a statistically significant decreasing effect on the occurrence of bad loans. Additionally, the findings also highlight that an increase in the inflation rate and the global crisis of 2008/09 have statistically significant positive impacts on credit defaults.

Garr (2013) investigates the impact of various factors on credit risk in commercial banks in Ghana. The study employs an unbalanced panel data set of 33 commercial banks spanning 21 years from 1990 to 2010. The analysis utilizes annual time series data during this period. The results indicate that credit risk in Ghana is influenced by several factors. Specifically, the study highlights the significance of per capita income as a measure of the standard of living, government borrowing, and financial sector development. The findings suggest that government borrowing and financial sector development are inversely related to credit risk, while there is a positive relationship between management inefficiency and credit risk.

Poudel (2013) conducted a research investigation into the macroeconomic determinants of credit risk in Nepal. The study reveals that inflation and fluctuations in foreign exchange rates have exerted an influence on the credit risk of banks. The implications of these findings are significant for policymakers, regulators, and managers, particularly considering the coverage of the recent crisis period. This study also contributes to filling the research gap by being the first comprehensive exploration of the determinants of credit risk, to the best of our knowledge.

Tehulu (2014) conducted a study to examine the specific determinants of bank credit risk. The research focused on 10 banks during the period 2007-2011, and the empirical analysis utilized GLS regression with random effects. The empirical findings indicate that credit growth and bank size have a statistically significant negative impact on credit risk. Additionally, financial stability is found to have a statistically significant negative effect on credit risk.

Similarly, Bajraktarovic et al. (2022) conducted a similar study on the determining factors of credit risks in the Western Balkan region. The paper presents an analysis of how certain parameters influence the performance of the banking system, particularly in relation to the movement of non-performing loans (NPLs). The research spans a 10-year period from 2010 to 2019, and it also provides a forecast of bad credit trends for the period 2020-2025. The authors utilized correlation and linear regression analysis in their study. The findings highlight that the unemployment rate is the most influential factor affecting non-performing loans in the Western Balkans region. The authors Siddiqui et al. (2012) researched the impact of the interest rate on non-performing loans. The research period covers the years 1996-2011

where data is collected quarterly. From the analysis of the Pooled OLS model, the findings show that the fluctuations (mainly the increase in the interest rate) have a positive impact on the growth of non-performing loans.

Tatarici et al. (2020) highlight the link between adverse macroeconomic conditions and higher NPL ratios, suggesting a cyclical pattern. Despite short-term negative effects on the economy, evidence indicates limited long-term implications for credit. The literature also underscores the influence of banking sector variables on NPLs, with Tatarici et al. (2020) emphasizing that a more profitable and well-capitalized banking sector tends to have lower NPL ratios. This highlights the crucial role of robust financial institutions in maintaining stability and reducing NPL prevalence.

The literature also delves into the significance of government effectiveness in mitigating NPLs. Evidence suggests that an improvement in government effectiveness contributes to a reduction in NPLs, highlighting the interplay between governance indicators and financial stability. Furthermore, studies in the literature, including Tatarici et al. (2020), shed light on the impact of past credit growth rates on current NPL ratios. Countries experiencing higher credit growth rates in the past tend to witness elevated levels of NPLs in subsequent periods. This insight underscores the importance of considering historical credit dynamics in understanding and addressing non-performing loans. The literature supports the adoption of macroprudential measures as a means of enhancing the resilience of borrowers and tempering the credit cycle. Tatarici et al. (2020) advocate for the use of tools such as debt service-to-income (DSTI) and loan-to-value (LTV) caps to regulate the level of indebtedness, thereby contributing to financial stability.

Ozili (2019) builds on the NPL model developed by Louzis et al. (2012), and Beck et al. (2015) to explore the dynamics of non-performing loans (NPLs). The study considers various factors, including financial intermediation, foreign bank presence, bank efficiency, loan loss coverage ratio, competition, banking system stability, banking crises, and bank concentration. Empirical findings reveal a nuanced relationship between financial development and NPLs, challenging the notion that it is uniformly beneficial. Ozili (2019) highlights determinants such as bank efficiency, loan loss coverage ratio, competition, and banking system stability, which are inversely associated with NPLs. Conversely, NPLs exhibit a positive association with banking crises and bank concentration. These insights emphasize the complex interplay of institutional and market factors shaping the NPL landscape, highlighting the need for comprehensive regulatory supervision. Regulators should consider both macro-level financial development structures and micro-level banking practices to effectively mitigate NPL risks.

There have been limited empirical studies examining the relationship between the unemployment rate and credit risk. However, the existing research conducted by Zheng (2019), Kjosevski (2019), and Lubis (2021) suggests a positive correlation between unemployment and economic growth. It is important to note that these studies do not explicitly consider the variables of the financial sector to establish a direct connection. Therefore, in this research, an attempt has been made to link the variables of the financial and social sectors to the impact on credit risk. The study includes both the financial sector variables (inflation, interest rate, financial stability) and the social variable (unemployment).

Regarding the empirical methodology, in the literature, most of the authors have developed the research with panel data. To address the issue of significant variations in panel data across different countries, this paper employs the Hausman-Taylor IV model. This modelling approach is utilized to mitigate the potential challenges associated with such variations in data.

3. Methodology

To analyze credit risk factors in the Southeast European Countries, panel data were used where 5 econometric models were applied; the first model executed is based on the method, Ordinary least squares (OLS), the second model Ordinary least squares robust (OLSR). While the models for the panel data are also used; fixed effect (FE), random effect (RE), and General method of moments (GMM).

In this section, we will discuss the development of econometric models to examine the influential factors impacting non-performing loans in the Western Balkan region. Various models will be presented, including pooled OLS, fixed effects, random effects, and the Hausman-Taylor instrumental IV model. The selection of the appropriate model is determined using the Hausman test, which compares fixed effects, random effects, and the Hausman-Taylor IV model. The results of the Hausman test demonstrate that the Hausman-Taylor instrumental IV model provides greater consistency and efficiency in analyzing the factors that determine non-performing loans. It is essential to address concerns related to endogeneity, as certain variables may be influenced by non-performing loans themselves, thus requiring careful consideration.

To satisfy the exclusion restriction required for valid instrumental variables, we ensured that the chosen instruments were correlated with the endogenous variables but not directly correlated with the dependent variable, non-performing loans (NPLit). This practice helps mitigate endogeneity concerns and enhances the reliability of our results. Since the Hausman-Taylor model is considered the most suitable model for the analysis of our data compared to the other executed models (POLS model, Fixed Effect, and Random Effect) (Table A2), then we use this model to investigate the determining factors of credit risk in the six countries of the Western Balkans in the period 2010-2021. For comparative purposes, the paper presents the summarized results of other models besides the Hausman-Taylor model. With the application of this model, we address the problem of endogeneity between variables, which is considered an important problem in empirical analyses. Considering the aforementioned concerns regarding endogeneity and the outcomes of the Hausman test, it can be concluded that the Hausman-Taylor IVs model is deemed more suitable when compared to the random and fixed effects models (as shown in Table A2).

The model, Hausman-Taylor, is defined as follows:

$$NPLit = c + B1 (NPLit - 1) + B2 (UNEit) + B3 (FSTABit) + B4 (GDPit) + B5(INFit) + B6 (IRit) + \mu it \quad (1)$$

Where NPLit is the dependable variable, (annual % of total loans), $i = 1 \dots 6$ (countries), $t = 2010 \dots 2021$ (years); c is constant; the explanatory variables include: $yit-1$, which is the

first lagged of a dependent variable, UNEit (Unemployment as a percentage); FSTABit (Financial Stability as an index); GDPit (Economic Growth as a percentage); INFit (Inflation rate as a percentage); IRit (Interest rate as a percentage), The interest rate variable is included in the study as the real interest rate, where the data is provided by the World Bank database, and uit is the exogenous disturbance.

Descriptive statistic

The empirical analysis conducted in this study covers the period from 2010 to 2021, encompassing panel data from six countries in the Western Balkans: Kosovo, Albania, North Macedonia, Montenegro, Bosnia and Herzegovina, and Serbia. The data used for this research were obtained from "The Global Economy" database and the World Bank database. Non-performing loans are represented as a percentage of total loans, while unemployment, inflation, interest rate, and economic growth are expressed in percentage units. Financial stability is measured using an index ranging from 0 to 100.

Table 1. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
NPL	72	9.062	5.423	1.933	22.244
UNE	72	20.968	6.735	9.08	35.3
FSTA	72	56.667	7.506	50	70
GDP	72	2.55	3.718	-15.307	12.434
INF	72	1.993	2.181	-1.584	11.137
IR	72	5.575	2.762	.088	11.54

Source: World Bank Data and the Global Economy Data, calculation by Author.

Data presented in Table 2 represent two key indicators – Financial Stability and Non-Performing Loans (NPLs) – for the Western Balkan region. Financial stability is a crucial aspect of a country's economic health, reflecting its ability to sustain economic growth and manage potential risks. The scores, ranging from 59 to 72, indicate the perceived level of financial stability in each country. Kosovo has the highest score of 72, suggesting a relatively more stable financial environment, while Bosnia and Herzegovina has the lowest score of 59, indicating a perceived lower level of financial stability.

Table 2. Descriptive Statistics by Country

State/Variable	Financial Stability	Non-Performing Loans
Albania	67	14.43
Kosovo	72	4.75
Bosnia and Herzegovina	59	11.25
Montenegro	61	12.64
North Macedonia	68	7.82
Serbia	64	8.12

Note: The data are presented as an average during the period 2010-2021.

Source: World Bank Data and the Global Economy Data, calculation by Author

Non-performing loans (NPLs) are a measure of the quality of a country's banking assets, indicating the proportion of loans that are not being repaid. Lower NPL percentages are generally seen as positive, as they suggest a healthier banking sector. In this context, Kosovo again stands out with the lowest NPL percentage of 4.75, signalling a sound loan portfolio. On the other hand, Bosnia and Herzegovina has the highest NPL percentage of 11.25, indicating a relatively higher proportion of non-performing loans.

4. Results

In this part, the results of the correlation analysis are first presented in order to identify the ratio of independent variables with non-performing loans. Based on the presented results of this coefficient, there is a positive ratio of non-performing loans with the unemployment rate ($r = 0.55$), the inflation rate ($r = 0.09$) and the interest rate ($r = 0.17$). So, the growth of these three indicators has a potential impact on the growth of bad loans and vice versa. Meanwhile, non-performing loans have a negative relationship with the variables; financial stability index ($r = -0.88$) and economic growth ($r = -0.40$). So, economic growth and increased financial stability have an impact on the reduction of non-performing loans.

Table 3. Correlation analysis

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) NPL	1.00					
(2) UNE	0.55	1.00				
(3) FSTA	-0.88	0.04	1.00			
(4) GDP	-0.40	0.02	0.09	1.00		
(5) INF	0.09	0.09	0.01	0.55	1.00	
(6) IR	0.17	0.17	-0.08	0.09	-0.33	1.00

The findings of the conducted econometric models are presented, encompassing four different models: pooled OLS, random effects, fixed effects, and the Hausman-Taylor model with IV instrumental variables. The results of the Hausman test can be found in Appendix 2, specifically Table A2, where a value of 9.42 ($P = 0.0052$) rejects the null hypothesis, indicating that the random effects model is less efficient compared to the fixed effects model. Due to the presence of endogeneity, the Hausman-Taylor model is employed. The outcomes of this model can be found in Table 2. The Hausman test was also used to compare the fixed effects model with the Hausman-Taylor model. With a test result of 5.13 ($P = 0.6632$), there is insufficient empirical evidence to reject the null hypothesis, thus indicating that the Hausman-Taylor model is more suitable for the empirical analysis.

Based on the result of the P value from Breusch Pagan's test ($P = 0.420$) (Appendix A3) we consider that the data are homoscedastic so that the problem of heteroscedasticity is not present in the study data. A Durbin-Watson test (Appendix A4) with a p-value of 0.601 indicates that there is insufficient evidence to reject the null hypothesis of no autocorrelation in the residuals of your regression analysis. In other words, the data does not provide significant statistical support for the presence of autocorrelation.

Drawing from the empirical results presented in Table 2, it can be observed that the unemployment variable has a positive and statistically significant impact on the growth of non-performing loans ($B = 0.249$) at a 1% significance level. This means that, on average, a 1% increase in the unemployment rate corresponds to a 0.24% increase in non-performing loans. These results align with previous studies conducted by Barajaktarovic (2022), Klein (2013), and Messai (2013).

Furthermore, the financial stability variable exhibits a negative and statistically significant impact on non-performing loans ($B = -0.406$) at a 1% significance level. For every additional unit in the financial stability index, non-performing loans decrease by an average of 0.40%. These findings are consistent with the research discussed by Ali (2010), Garr (2013), and Tehulu (2014).

Table 4. Regression results

Variables	OLS NPL	Fixed-Effects NPL	Random-Effects NPL	Hausman-Taylor NPL
NPL_L1				0.431*** (0.04)
UNE	0.160* (2.00)	0.146 (1.27)	0.160* (2.00)	0.249*** (0.023)
FSTA	-0.290*** (-4.35)	0.213 (0.184)	-0.290*** (-4.35)	-0.406*** (-0.051)
GDP	0.184 (1.36)	0.244* (2.55)	0.184 (1.36)	-0.194** (0.312)
INF	-0.814** (-3.34)	-0.508** (-2.79)	-0.814*** (-3.34)	-0.943*** (-0.242)
IR	1.237*** (5.94)	1.049*** (5.5)	1.237*** (5.94)	1.452*** (0.209)
_cons	-9.752* (-2.16)	0.536 (0.29)	-9.752* (-2.16)	7.421** (3.42)
R	0.4909	0.5567	0.536	
N	72	72	72	72

Notes: ***Statistically significant at 1% level, **statistically significant at 5% level, *statistically significant at 10% level

Table No. 4 shows that economic growth has a negative impact on non-performing loans ($B = -0.19$), which is statistically significant at the 5% significance level. So, for every 1% economic growth, non-performing loans decreased by 0.19% on average. This result is compatible with the findings of the authors Das (2007) and Garr (2013).

Regarding the inflation rate, there is a negative impact on non-performing loans ($B = -0.943$) which is statistically significant at the 1% significance level, so for every 1% increase in the inflation rate, non-performing loans decreased by 0.94% on average. Meanwhile, the real interest rate has a positive impact on non-performing loans ($B = 1.452$), which is statistically significant at the 1% level, so for every 1% increase in the real interest rate, non-performing loans increased by 1.45% on average, and this result is compatible with the findings of the authors Siddiqui et al. (2012).

The empirical analysis presented in this study provides valuable insights into the dynamics of non-performing loans in the Western Balkans from 2010 to 2021. The dataset, comprising

panel data from six countries, namely Kosovo, Albania, North Macedonia, Montenegro, Bosnia and Herzegovina, and Serbia, draws from reputable sources such as "The Global Economy" database and the World Bank database. The research focuses on the relationship between non-performing loans and key economic indicators, including unemployment, inflation, interest rate, economic growth, and financial stability measured by an index ranging from 0 to 100.

The correlation analysis reveals significant associations between non-performing loans and several independent variables. Notably, a positive correlation is identified between non-performing loans and the unemployment rate, inflation rate, and interest rate. Conversely, a negative correlation is observed between the financial stability index and economic growth. These results set the stage for a more in-depth exploration through econometric models, where the study employs pooled OLS, random effects, fixed effects, and the Hausman-Taylor model with IV instrumental variables.

The econometric models yield crucial findings. The positive and statistically significant impact of the unemployment variable on non-performing loans aligns with prior studies, indicating that a 1% increase in the unemployment rate corresponds to a 0.24% increase in non-performing loans. Moreover, the negative impact of the financial stability variable on non-performing loans supports existing research, suggesting that an increase in the financial stability index leads to a decrease in non-performing loans. Additionally, economic growth and inflation rates exhibit negative impacts on non-performing loans, while the real interest rate has a positive impact. These findings contribute to the understanding of the complex interplay between macroeconomic factors and the health of banking systems in the region.

The study not only establishes significant correlations between non-performing loans and key economic indicators but also employs robust econometric models to delve into the nuances of these relationships. The findings underscore the importance of addressing unemployment, enhancing financial stability, and fostering economic growth as strategies to mitigate non-performing loans in the Western Balkans. The study's academic rigour, data sources, and comprehensive analysis enhance its contribution to the existing literature on financial stability and macroeconomic factors in emerging economies.

Table 5. The results of the econometric model according to the countries of the Western Balkans

States/Variables	Albania	Kosovo	Bosnia and Herzegovina	Montenegro	North Macedonia	Serbia
NPL_L1	0.234*	0.118**	0.241**	0.433	0.378*	0.401**
UNE	0.132**	0.432*	0.340*	0.333**	0.371	0.431*
FSTA	-0.301*	-0.218**	-0.221*	-0.042*	-0.130*	-0.131
GDP	-0.112*	-0.042	-0.018	-0.102*	-0.342*	-0.142**
INF	-1.31*	-0.874	-1.08*	-1.728**	-0.874*	-0.942
IR	1.487*	1.421*	0.984	1.112*	1.643*	1.741*
cons	6.42***	5.64***	7.421***	8.12***	8.931***	3.145***

Notes: ***Statistically significant at 1% level, **statistically significant at 5% level, *statistically significant at 10% level.

According to the results presented in Table 5, there are no very big differences in the coefficients according to the states of the study and the coefficients are presented as a total (Table 4).

According to the results presented we don't have variability in the sign of the coefficient for any variable, but there are small differences in the significance of the variables, where in some countries we have significance up to the level of 1% (***), while in some countries, that of Montenegro, the impact is more slightly significant at 10% or 5%.

5. Conclusions

Using the empirical model of endogeneity (Hausman-Taylor) we have presented the determinants of credit risk in terms of non-performing loans in six countries of the Western Balkans for the period 2010-2021. The results from the empirical analysis presented show that unemployment and the real interest rate have a positive impact on the growth of non-performing loans where both coefficients are statistically significant at the 1% level, while other variables (Financial stability, economic growth, and interest rate of inflation) show a statistically significant negative impact.

The paper emphasizes the importance that the countries of the Western Balkans, as still developing countries, must maintain sustainable financial stability, where these countries can achieve this stability by implementing sound fiscal policies and reducing public debt. In addition, the development of the financial sector can help increase access to credit and improve financial intermediation. This can be achieved through measures such as strengthening banking supervision, improving financial regulation, and promoting financial education.

The findings of this study have important policy implications and recommendations for the countries of the Western Balkans. To maintain sustainable financial stability, policymakers should have to keep the high inflation rates under control and create financial stability. The development of the financial sector through measures such as strengthening banking supervision, improving financial regulation, and promoting financial education can help increase access to credit and improve financial intermediation. This would lead to lower non-performing loans and ultimately contribute to a healthier financial system. In addition, reducing unemployment should be a priority for policymakers in the region. Encouraging entrepreneurship and small business development can create new jobs and reduce unemployment. Stimulating economic growth through investment in infrastructure and improving the business environment can also create new job opportunities. Improving education and skills training is also essential to reduce unemployment. By focusing on these policy recommendations, the countries of the Western Balkans can create sustainable economic growth and reduce credit risk in the long term.

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APPENDIX

Table A1. Description of variables

No.	Variables	Unit	Code
1	Non-Performing Loans	% of all Loans	NPL
2	Unemployment	%	UNE
3	Financial Stability	Index, 0-100	FSTA
4	GDP Growth	Annual %	GDP
5	Inflation	%	INF
6	Real Interest Rate	%	IR

Table A2. Hausman Test

Test	Chi ²	Prob > Chi ²	Results
Fixed vs Random	9.42	0.0052	Reject Hypothesis zero
Fixed vs Hausman Taylor	5.13	0.6632	Does not Reject Hypothesis zero

Table A3. Breusch Pagan Test for heteroskedasticity

Cook-Weisberg test for heteroskedasticity	Breusch-Pagan
chi2(1)	2.14
Prob > chi2	.601

Table A4. Durbin Watson for autocorrelation

Durbin Watson	Breusch-Pagan
chi2(1)	6.210
Prob > chi2	.420